Preventive Medicine 85 (2016) 78–83

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Preventing dementia by promoting physical activity and the long-term impact on health and social care expenditures

Pieter H.M. van Baal [a,*], Martine Hoogendoorn [a], Alastair Fischer [b]

[a] Institute of Health Policy and Management, Erasmus University Rotterdam, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands
[b] Centre for Public Health, National Institute for Health and Care Excellence (NICE), 10 Spring Gardens, London SW1A 2BU, UK

ARTICLE INFO

Available online 26 January 2016

Keywords:
Dementia
Prevention
Physical activity
Health care
Social care
Simulation modeling

ABSTRACT

Background. Preventing dementia has been proposed to increase population health as well as reduce the demand for health and social care. Our aim was to evaluate whether preventing dementia by promoting physical activity (PA) a) improves population health or b) reduces expenditure for both health and social care if one takes into account the additional demand in health and social care caused by increased life expectancy.

Methods. A simulation model was developed that models the relation between PA, dementia, mortality, and the use of health care and social care in England. With this model, scenarios were evaluated in which different assumptions were made about the increase in PA level in (part of) the population.

Results. Lifetime spending on health and social care related to dementia was highest for the physically inactive (£28,100/£28,900 for 40-year-old males/females), but spending on other diseases was highest for those that meet PA recommendations (£55,200/£43,300 for 40-year-old males/females) due to their longer life expectancies. If the English population aged 40–65 were to increase their PA by one level, life expectancy would increase by 0.23 years and health and social care expenditures would decrease by £400 per person.

Conclusions. Preventing dementia by increasing PA increases life expectancy and can result in decreased spending overall on health and social care, even after additional spending during life years gained has been taken into account. If prevention is targeted at the physically inactive, savings in dementia-related costs outweigh the additional spending in life years gained.

© 2016 Elsevier Inc. All rights reserved.

Introduction

Dementia, often called the "most feared disease," has a high societal burden in terms of disability and mortality as well as usage of health care, informal care, and institutional long-term care (WHO, 2012; Wimo et al., 2013; Schaller et al., 2014). Total annual costs for dementia in the United Kingdom (UK) were recently estimated at £22.7 billion, or £27,600 per patient, of which 54% consisted of costs for informal care and 40% of costs for long-term care (Luengo-Fernandez et al., 2010). As a way of countering the burden of dementia, it has been proposed to invest more in its prevention (Yaffe et al., 2014), especially relevant given that there has been virtually no progress in the treatment of the disease. Although epidemiological research has identified several modifiable risk factors for the onset of dementia, targeting physical inactivity (PA) seems to be the factor that has the greatest potential in terms of reducing dementia prevalence (Barnes and Yaffe, 2011; Norton et al., 2014).

When answering the question of whether preventing dementia will reduce the demand for health care, it is not sufficient to look at savings in dementia-related costs only. As dementia substantially increases mortality risk, preventing dementia will increase life expectancy (Rait et al., 2010; Ganguli et al., 2005; Brodaty et al., 2012; Xie et al., 2008). Increased life expectancy for such people exposes them to other diseases and/or disabilities that also result in health and social care use (Bonneux et al., 1998). Consequently, preventing dementia may lead to a reduction in dementia-related costs in the short run but to higher costs in the long run, because of additional costs occurring in the additional life years that people live. Many studies evaluating the effects and costs of preventive interventions include only those future costs related to the risk factor or disease being investigated which may lead to false claims that prevention will reduce the demand for health care (Bonneux et al., 1998; Barendregt et al., 1997; van Baal et al., 2008). However, given that dementia is one of the most costly diseases, it is worthwhile investigating whether preventing dementia could result in cost savings in the long run even if costs of competing diseases in life years gained are taken into account.

The aims of the current study were to estimate the burden of dementia in England associated with physical inactivity and assess the potential health benefits and changes in health care and social care

* Corresponding author.
E-mail addresses: vanbaal@bmg.eur.nl (P.H.M. Baal), hoogendoorn@bmg.eur.nl (M. Hoogendoorn), Alastair.Fischer@nice.org.uk (A. Fischer).

http://dx.doi.org/10.1016/j.ypmed.2016.01.013
0091-7435/© 2016 Elsevier Inc. All rights reserved.

expenditures associated with increasing PA levels using a dynamic modeling approach. In doing so, we explicitly took into account the costs that might be a result of increased life expectancy.

Methods

Model structure

To model the impact of PA on dementia and health and social care expenditures, a Markov-type model was developed distinguishing the following states: two health states ("no dementia" and "dementia") and the state "death". Each health state was further stratified by gender, age, and physical activity level. PA level was divided into four classes: "inactive," "low activity," "some activity," and "meets recommendations," based on the classification used in the 2012 English National Health Survey (Bridges et al., 2013). The level of PA was modelled to have an impact on the risk of developing dementia and the risk of dying. Compared to no dementia, having dementia was associated with an increase in mortality and an increase in the use of health and social care. This model structure has been applied previously in other simulation models describing the link between risk factors, chronic diseases, and mortality (van Baal et al., 2006; Hoogenveen et al., 2010; Boshuizen et al., 2012). Fig. 1 displays the basic structure of the model employed in this study.

The starting population of the model was the population of England in 2012 specified by gender, age, PA level, and disease status. The model simulated the annual changes in the population over time due to changes in PA level, incidence of dementia, and mortality. Cycle length of the model was 1 year, indicating that changes in the population took place on an annual basis. The time horizon of the analysis was life-time.

The demographic, epidemiological, and cost input parameters for the model were derived from multiple sources. Relative risks describing the relation between PA and the onset of dementia as well as mortality were taken from published meta-analyses (Sofi et al., 2011; Samitz et al., 2011). All other input parameters of the model were derived from English data sources. Cost parameters in the model were derived from studies using large administrative datasets (Kasteridis et al., 2014; Georghiou et al., 2012). We refer to the supplementary file for a more detailed description of the model and the data sources used to estimate parameters of the model.

Calculating costs with the model

Health and social care costs related to dementia were estimated within the model by multiplying dementia prevalence numbers by the annual costs per dementia patient specified by age and gender. Besides age and gender, a distinction has been made between dementia costs in the last year of life and "other years." This has been done as health and social care expenditures are known to be concentrated in the last phase of life (de Meijer et al., 2011; Wong et al., 2011; Seshamani and Gray, 2004).

To calculate health-care costs for all "other" diseases, the numbers of survivors without dementia estimated within the model were multiplied by age- and gender-specific per capita average costs for all other diseases. Here again, we made a distinction between costs in the last year of life and other years. Because lower levels of PA are related to a higher mortality risk compared to "meeting recommendations" with respect to PA, the annual health care and social care costs for an inactive person are higher (van Baal et al., 2011). In this way, costs were made indirectly to depend on PA level because no studies in the UK related PA level to health care use. All costs were expressed in 2012 prices.

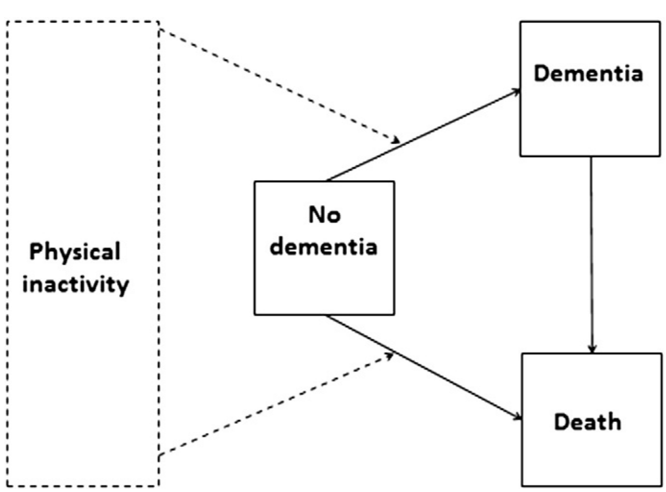

Fig. 1. Model structure.

Current practice scenario

In the current practice scenario, the model was run for a lifetime horizon assuming that persons did not change their physical activity level, so inactive people remained inactive till they died, low active people remained low active till they died, etc. Outcomes for the model projections over time were life expectancy, years with dementia, health care costs defined as costs borne by the National Health Service (NHS)(dementia versus other diseases), and social care costs (dementia versus other diseases) specified for each PA class.

Intervention scenarios

In addition to the current practice scenario, several intervention scenario analyses were run in which the assumption was made that part of the population would become more active. An increase in PA was hypothesized to result in a lower new incidence of dementia, lower mortality, lower dementia-related costs, but higher costs for other diseases compared to the current practice scenario. To illustrate the potential impact of an increase in physical activity level, three different intervention scenario analyses were performed for a cohort of 1000 people (500 males and 500 females) aged 40 at baseline assuming that 1) an inactive cohort would become low active, 2) a low active cohort would become somewhat active, and 3) a somewhat active cohort would become more active and would thus meet recommendations.

In addition, two different intervention scenario analyses were performed at a population level showing the impact of changes in physical activity level in the English population aged 40–65 assuming that 4) everyone were to increase their physical activity level by one class and 5) everyone would meet recommendations. For all scenario analyses, a lifetime horizon was used.

Sensitivity analysis

Probabilistic sensitivity analysis (PSA) was performed to translate uncertainty surrounding the input parameters into uncertainty around the outcomes of the model. In addition to the PSA, several one-way sensitivity analyses were performed to estimate the impact of key model parameters or assumptions on the outcomes.

- *Sensitivity analysis 1* (*SA1*). The effect of PA on all-cause mortality in our model was quite small if compared to estimates published by the US Physical Activity Guidelines Advisory Committee (U.S. Department of Health and Human Services, 2008). Therefore, SA1 investigated the impact of using other relative risks for the association between physical activity level and all-cause mortality. Based on data from the US Physical Activity Guidelines Advisory Committee (U.S. Department of Health and Human Services, 2008), RRs compared to being active were calculated to be 0.90 for low activity, 0.80 for some activity, and 0.73 for meets recommendations in SA1.
- *Sensitivity analysis 2* (*SA2*). In our base-case analysis, we assumed that the relative risks of PA on mortality and dementia onset could be applied to all ages. However, there is not that much evidence of the effect of PA on mortality and dementia for the eldest elderly. SA2 investigated the impact of applying the relative risks for all-cause mortality and dementia onset not to the entire age range, but only to ages 90 and below. All relative risk values above the age of 90 were set to one.
- *Sensitivity analysis 3* (*SA3*). A general problem when quantifying the relation between PA and the onset of dementia is that studies do not provide detailed information on how PA is measured and defined. In this sense, the way we used relative risks for the onset of dementia for the different PA classes is a bit arbitrary. Therefore, in SA3, different RRs for PA level in relation to the onset of dementia were used. In the base-case analysis, an RR of 0.65 was applied to both the low and some activity group. In SA3, the assumption was made that the RR of 0.65 only applied to the group with some activity and the RR for the low activity group was then calculated to be 0.89 based on interpolation and the estimated PA in hours per week in the groups.
- *Sensitivity analysis 4* (*SA4*). In SA4, costs for diseases other than dementia were made dependent on age only and not on last year of life as was done

Download English Version:

https://daneshyari.com/en/article/3100327

Download Persian Version:

https://daneshyari.com/article/3100327

Daneshyari.com